

LISTING OF CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application.

1. (Previously Amended) A plasma processing system comprising:

a plasma processing chamber;

a vacuum pump connected to the processing chamber;

a substrate support on which a substrate is processed within the processing chamber;

a dielectric member having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber;

a gas injector extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber, the gas injector including a plurality of gas outlets supplying process gas at flow rates that are independently varied between at least some of the outlets into the processing chamber, the gas outlets being supplied process gas by a single gas supply; and

an RF energy source which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate.

2. (Original) The system of Claim 1, wherein the system is a high density plasma chemical vapor deposition system or a high density plasma etching system.

3. (Original) The system of Claim 1, wherein the RF energy source comprises an RF antenna and the gas injector injects the process gas toward a primary plasma generation zone in the chamber.
4. (Previously Amended) The system of Claim 1, wherein the gas outlets include a single on-axis outlet in an axial end surface of the gas injector and a plurality of off-axis outlets in a side surface of the gas injector, the on-axis outlet and the off-axis outlets being supplied process gas from the single gas supply via first and second gas lines, the gas lines including flow controllers which provide adjustable gas flow to the on-axis outlet independently of the off-axis outlets.
5. (Previously Amended) The system of Claim 1, wherein the gas outlets include a center gas outlet extending in an axial direction perpendicular to the exposed surface of the substrate and a plurality of angled gas outlets extending at an acute angle to the axial direction, the center gas outlet receiving process gas supplied by a first gas line and the angled gas outlets receiving process gas from a second gas line, the first and second gas lines receiving process gas from the single gas supply.
6. (Original) The system of Claim 1, wherein the gas injector injects the process gas at a subsonic, sonic, or supersonic velocity.

7. (Previously Amended) A plasma processing system comprising:

a plasma processing chamber;

a vacuum pump connected to the processing chamber;

a substrate support on which a substrate is processed within the processing chamber;

a dielectric member having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber;

a gas injector extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber, the gas injector including a planar axial end face having an on-axis outlet therein and a conical side surface having off-axis outlets therein, the on-axis outlet receiving process gas from a central passage in the injector and the off-axis outlets receiving process gas from an annular passage surrounding the central passage, the gas injector supplying process gas at flow rates that are independently varied between at least some of the outlets including the on-axis outlet into the processing chamber; and

an RF energy source which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate.

8. (Original) The system of Claim 1, wherein the gas injector is removably mounted in the dielectric window and supplies the process gas into a central region of the chamber.

9. (Previously Amended) A plasma processing system comprising:

a plasma processing chamber;

a vacuum pump connected to the processing chamber;

a substrate support on which a substrate is processed within the processing chamber;

a dielectric member having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber;

a gas injector extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber, the gas injector including at least one on-axis outlet which injects process gas in an axial direction perpendicular to a plane parallel to an exposed surface of the substrate and off-axis gas outlets which inject process gas at an acute angle relative to the plane parallel to the exposed surface of the substrate, the gas injector supplying process gas at flow rates that are independently varied between at least some of the outlets into the processing chamber; and

an RF energy source which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate.

10. (Previously Amended) A plasma processing system comprising:

a plasma processing chamber;

a vacuum pump connected to the processing chamber;

a substrate support on which a substrate is processed within the processing chamber;

a dielectric member having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber;

a gas injector removably mounted in an opening in the dielectric member and extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber, a vacuum seal being provided between the gas injector and the dielectric window, the gas injector including a plurality of gas outlets supplying process gas at flow rates that are independently varied between at least some of the outlets into the processing chamber; and

an RF energy source which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate.

11. (Original) The system of Claim 1, wherein the RF energy source comprises an RF antenna in the form of a planar or non-planar spiral coil and the gas injector injects the process gas toward a primary plasma generation zone in the chamber.

12. (Previously Amended) The system of Claim 1, wherein the single gas supply is split into multiple gas supply lines to feed the gas outlets.

13. (Original) The system of Claim 1, wherein the ratio of gas flow through at least some of the gas outlets is independently varied using variable flow restriction devices.

14. (Original) The system of Claim 1, wherein the ratio of gas flow through at least some of the gas outlets is independently varied using a network of valves and throttling elements.

15. (Original) The system of Claim 1, wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector.

Claims 16-38 (Canceled).